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April 27, 2012

Mr. Michael Bower
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ECOLOGICAL RISK-BASED SCREENING LEVELS FOR USE IN ECOLOGICAL RISK ASSESSMENTS AT THE SANTA SUSANA FIELD LABORATORY, VENTURA COUNTY, CALIFORNIA.

Dear Mr. Bower,

Please find attached the DTSC comments on the draft technical memorandum entitled *Ecological Risk-Based Screening Levels for Use in Ecological Risk Assessments at the Santa Susana Field Laboratory, Ventura County, California*. The technical memorandum describes the methods and assumptions used in the calculation of ecological risk-based screening levels (EcoRBSLs) for the SSFL, and presents proposed EcoRBSLs for use in characterization and ecological risk assessments for soil, sediment, surface water and groundwater.

The EcoRBSLs are intended for use on the Boeing portions of the site only. Screening levels for NASA and Department of Energy portions of the site will comply with the requirements in the Administrative Orders on Consent in place for those parties.

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If you have any questions regarding this letter or would like to schedule a meeting to discuss the enclosed comments, please contact Brian Faulkner at bfaulkne@dtac.ca.gov or (916) 255-6625, or myself at rpaulson@dtsc.ca.gov or (916) 255-3702.

Sincerely,

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Enclosure: *Review of Draft Ecological Risk Based Screening Levels*

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DATE: 1/26/2012

SUBJECT: REVIEW OF DRAFT ECOLOGICAL RISK BASED SCREENING LEVELS FOR USE IN ECOLOGICAL RISK ASSESSMENTS AT THE SANTA SUSANA FIELD LABORATORY, VENTURA COUNTY, CA.

PCA: 22120 Site Code: 300032 MPC: 38

Background

The Santa Susana Field Laboratory (SSFL) occupies approximately 2850 acres and is located 29 miles northwest of downtown Los Angeles, in the Simi Hills of Ventura County. SSFL is jointly owned by The Boeing Company and National Aeronautics and Space Foundation (NASA), and 90 acres of the Boeing-owned property is leased by the Department of Energy (DOE). Primary site activities at SSFL have included research and development of liquid and solid fueled rocket engines and associated components, which began in 1948, and nuclear energy research, which was also conducted on site within areas leased to DOE. On-site activities peaked in the 1950's through 1970's, and mostly ended by 2005. The site is divided into four administrative areas (Areas I, II, III, and IV) and within each administrative area there are multiple RFI areas.

Previously, Ecological Screening Levels (ESLs) were developed to be used in the characterization of contaminated sites at the SSFL (MWH, 2005). In the more recent technical memorandum "Proposed Approaches for Streamlining Future Ecological Risk Assessments at the Santa Susana Field Laboratory, Ventura County, California (MWH, 2009), the respondents proposed using a "sum of fractions approach" for assessing risk. This method will employ chemical-, medium- and receptor-specific ecological risk-based screening levels (EcoRBSLs). The EcoRBSLs can be either medium-specific benchmarks for lower trophic level receptors (e.g., for soil invertebrates, terrestrial plants, the water column community, and the sediment benthic community), or they can be calculated dose-equivalent medium concentrations for mammals and birds. The EcoRBSLs will be compared to site exposure point concentrations to calculate ecological HQs/HIs for both chemicals and radionuclides for each of the selected receptors, rather than forward calculations of dose that were used in risk assessments for the site previously.

Unlike the ESLs, the EcoRBSLs have been calculated for both no-effect levels (low EcoRBSLs) and effect-based levels (high EcoRBSLs) for upper level trophic receptors (birds and mammals) in order to provide more information for risk management decision-making. High EcoRBSL values were also developed, in order to evaluate soil vapor exposures for the deer mouse in a previously submitted technical memorandum (MWH, 2011a). The toxicity reference values (TRVs) for plants, invertebrates, and soil vapor exposures in the deer mouse were previously developed as media concentrations based (rather than dose-based), and are equivalents of the EcoRBSLs; therefore, the values presented in the report were already presented in previous technical memoranda (MWH, 2011a, and MWH, 2011b) that have been reviewed and accepted by ERAS. The TRVs that are dose-based (birds and mammals) were used to back-calculate concentration-based EcoRBSLs for media (soil/sediment/surface water), using site-specific or literature-derived exposure factors. These include some factors that were approved previously in SRAM rev 2 (MWH, 2005), as well as some that have been proposed for revision in the current report.

One of the consequences of this current revision will be that Appendix C in the SRAM rev 2(MWH, 2005) will be deleted because the ESLs will not be used in future activities conducted at the SSFL. The EcoRBSLs, presented in Tables 12-1 through 12-5 of this report, will replace the ESLs for future ecological risk assessments.

Document Reviewed

ERAS reviewed the technical memorandum "Ecological Risk Based Screening Levels for Ecological Risk Assessments at the Susana Field Laboratory, Ventura County, CA", hereafter referred to as the "the report". The report was prepared by MWH and was received as an e-mail attachment from Bruce Narloch (MWH) to Brian Faulkner dated 11/24/2011. An excel spreadsheet with the RBSL calculations, named "Draft EcoRBSL Workbook (11-23-2011).xls" was provided in a separate e-mail on the same date. The ecological risk characterization methods that are the primary subject of the report are

contained within Section 12 of the SRAM rev 2 (MWH, 2005). In order to eliminate potential redundancies or inconsistencies between the revised risk characterization methods presented in this technical memorandum with those described in the SRAM (MWH, 2005), Section 12 of the SRAM (MWH, 2005) has been updated in its entirety and the revised text is contained as the Attachment 1 portion of the report in redline/strikeout. ERAS also reviewed the previously updated sections of SRAM Rev 2, which include revised sections 3.2, 9, 10 (MWH, 2010) and 11 (MWH, 2011) for context and information connected to the revisions of SRAM rev 2 section 12, and several guidance documents and references that have been utilized in the revised SRAM sections or spreadsheets (including Bechtel Jacobs Company LLC, 1998, USEPA 2005, USEPA 2007a, b, c and d, and Sample *et al* 2008).

Scope of the Review

The report was reviewed for scientific content related to ecological risk assessment. ERAS assumes that the sampling procedures, analytical methods, and Quality Assurance/Quality Control (QA/QC) procedures were reviewed previously in the assessment process by regional personnel. Grammatical or typographical errors that do not affect the interpretation of the text may or may not have been noted. Related discussions within other portions of the report, not specifically referenced, should be appropriately revised to reflect these comments as well. Content in this memo that is reproduced from the report in the specific comments is presented in bold italic.

General Comment

1. Given that both low and high TRV-based EcoRBSLs have now been developed and proposed for avian and mammalian receptors at SSFL, as presented in the report, ERAS questions the need to continue using both the Central Tendency Estimate (CTE) and Reasonable Maximum Exposure (RME) to estimate ranges of hazard. The use of both the CTE and RME, along with the high and low EcoRBSLs, will generate four HQs/HIs per constituent. ERAS notes that the CTE HQ/HI estimates have been removed from the HHRA methodology (Donald Greenlee, Pers Com) and suggests that, given that high and low TRV-based EcoRBSLs are to be used in future risk assessments for describing risk ranges from a range of no effect to potential effect level, perhaps the CTE calculations for ecological receptors should be eliminated for future ecological risk assessments as well. This would help to streamline the ecological risk assessment process. If the respondents disagree, it would be useful to have a more detailed description in the text as to how the CTE HQs for high and low EcoRBSLs will add value to the weight of evidence evaluation and risk management decision-making. Also, ERAS will defer to risk managers if they are of the opinion that having both the CTE and RME HQs/HIs, for both the no-effect and effect-based Eco-RBSLs would be useful for risk management decision-making.

Specific Comments

1. **Section 12.1.1 (Hazard Quotients), page 4** "As presented in Section 10.6.1, EPCs will be derived for dioxins/furans as the 2,3,7,8-TCDD TEQ and for coplanar PCBs as the coplanar PCB TEQ, as described in Section 10.6.1." Correct for redundancy.

2. Section 12.1.2 (Hazard Index), Pages 5-6. This revised section does not exclusively discuss the Hazard Index (HI), the last newly added paragraph describes risk characterization using both HQs and HIs. There is nothing incorrect about the text, it just seems like it would be more appropriate in another section, or the section name should be revised to better reflect the newly added text.

3. Section 12.1.2 (Hazard Index), Page 6. **"An HQ or HI based on Low EcoRBSLs with a value greater than or equal to 1 suggests that additional evaluation is required"**. ERAS agrees with this approach, as it is consistent with DTSC guidance (1997). It would be useful if the potential components of such an evaluation could be described in more detail in the report so that concurrence on the approach could be reached. As stated in previous reviews (DTSC 2007, 2008a, 2008b, 2010), ERAS would not support use of a separate set of non-DTSC approved BERA TRVs, or the use of BERA TRV based EcoRBSLs, to be used in additional evaluation to eliminate CPECs without risk management input; however, a side by side comparison as part of a weight of evidence evaluation would be acceptable. Also, this statement is not consistent with the last section of the text (section 12-4), which only discusses the need for additional evaluation if the HQ/HI> 1 based on the high EcoRBSL(see specific comment 6), and does not clearly state what, if any, actions should be undertaken if the Low EcoRBSL HQ is > 1 but the high EcoRBSL HQ < 1 . Please revise section 12.4 of the report to be consistent with this statement.

4. Section 12.1.3 (Ecological RBSLs), page 6. "***HERD Ecological Risk Assessment Notes: Numbers 1-5.* (DTSC, 1998 – 2003).**" ERAS recommends updating this to include Econote 6 (DTSC, 2009). This document represents a revision to the cadmium toxicity reference value (TRV) for birds used by regulatory agencies and resource trustees in California for predictive ecological risk assessments, The revised cadmium TRV (0.7 mg/kg-day) is listed in the calculations in the spreadsheet, so perhaps updating the text was just an oversight.

5. Section 12.1.1.2 (EcoRBSLs for Representative Species in Terrestrial Habitats/ Terrestrial Plants), page 11. **"These lists of effect concentrations are compilations of published benchmark values that represent effect levels, values adjusted to a "no effect" level, as well as true "no effect" levels."**

Most plant TRVs are not adjusted to a "no effect" level; this is also true for the soil invertebrate TRVS used to calculate the EcoRBSLs. Most of these are acutely lethal doses, concentrations such as LC_{50}s, divided by an uncertainty factor of as little as 5, to estimate a LOAEL. As such, if these EcoRBSLs are exceeded, it is generally more likely that impacts will occur to these communities than if the low EcoRBSLs are exceeded for mammals and birds, although there is also a large degree of uncertainty regarding these TRVs, as they are often based on acute studies which may not be accurate predictors of chronic effects. This comment is primarily informational and meant for the DTSC project managers; no response from the respondent is required.

6. Section 12.4 (Ecological Risk Decision Criteria), page 28. ERAS agrees with many of the described criteria, namely that *de minimus* risk likely exists for samples in which the HQ/HI < 1 for the low EcoRBSL, and that evaluation by risk managers is recommended if HQ/HI > 1 for samples compared the high EcoRBSL, as above these levels indicates that adverse effects are expected (see SRAM rev 2, 2005) However, DTSC ecological risk assessment guidance (DTSC, for HQs/HIs > 1 for low TRV doses is that such circumstances also merit risk management input regarding the need for additional evaluation or action (see DTSC Ecological Risk Assessment Guidance, DTSC 1996 and HERD Econote 4, DTSC 2000), and as such ERAS recommends that the risk decision criteria be revised to reflect this. Perhaps adding text to last section, regarding the potential for recommending a Phase III Impact Assessment, that explicitly discusses the range in with the HQ/HI > 1 for the low EcoRBSL but is <1 for the high EcoRBSL, would help to clarify this.

7. Table 12-5 (Summary of the Ecological Risk-Based Screening Levels for Chemicals Detected in Soil Vapor). Please add a note referencing the soil inhalation Technical Memorandum (MWH, 2011) to the notes for this table.

8. Figure 12-1 (Ecological Risk Characterization Flowchart). ERAS has identified several issues with this flowchart that should be considered for revision. One, the use of the CTE HQ for low TRV seems unnecessary. as if the CTE HQ/HI > 1, then the HQ/HI will also be > 1 for the RME-based EcoRBSL. Also, no role is provided for using the CTE for TRV High (what will it be used for? See also general comment. Finally, there are two "yes" answers for RME question box, which seems to demonstrate the need for an additional yes/no question to separate these arrows. See attachment 1 to this memorandum. The figure does provide direction as to how to proceed through the risk characterization that ERAS suggested should be presented in more detail in section 12.4, so need to tie that section and the flowchart together better (see also specific comment 6).

General Comment, "Draft EcoRBSL Workbook (11-23-2011)"

1. ERAS reproduced the calculations of several EcoRBSLs for each media and found no errors in the spreadsheet calculations of the EcoRBSLs. Review of the TRVs, exposure parameters, and other spreadsheets provided also did not result in finding any errors.

Specific Comments, "Draft EcoRBSL Workbook (11-23-2011)"

1. Table 10-6 (Summary of Terrestrial Bioaccumulation Factors for Chemicals Detected in Soil). In the column named "Soil Invertebrate BAF (dry weight/dry weight)", the BAF for many chemicals is listed as "Log Kow model". If single BAFs were calculated using the log kow model from EPA the actual BAFs should be listed in the table to facilitate review.

2. Table 10-6 (Summary of Terrestrial Bioaccumulation Factors for Chemicals Detected in Soil): PAHs for which sites specific data are lacking for small mammals are set to BAF = 0, with citation from EPA guidance (Guidance for Developing Ecological Soil Screening Levels, USEPA, 2007). In this guidance it is assumed that all PAHs do not bioaccumulate or biomagnify in terrestrial mammals, based on rapid metabolism and excretion of PAHs. However, this assumption that the BAFs for all PAHs=0 is contradicted by actual data collected at SSFL, where no soil to mammal BAF for detected PAHs was found to = 0; in fact. BAFs ranged up to 16 (MWH, 2005). ERAS recommends that PAHs for which data were not available (Acenaphthene. Acenaphthylene, Anthracene, Benzo(e)pyrene, Fluorene, and Naphthalene) be assigned default BAFs of 1, rather than 0, so potential food web exposures will be considered as a complete pathway for these chemicals. Using a default BAF of 1 for organic compounds is consistent with USEPA guidance (USEPA, 2005) and with the SRAM rev 2 (2005). This concern regarding the assumption that bioaccumulation of PAHs in small mammal tissues is zero (diet for carnivores) was also commented on by a reviewer of the EcoSSL document for PAHs (USEPA, 2007).

   Setting the soil to mammal BAFs = 1 essentially assumes that the concentration present in the biota is equal to the soil concentration. ERAS agrees that is an arbitrary assumption but no more so than setting the BAF= 0 without data to support the development of a representative value. Setting the BAF to 1 at least allows the pathway to be considered in the ecological risk assessment. It can also be seen from the other PAH BAFs from SSFL that this may still underestimate concentrations in tissue for many PAHs, while it may be an overestimate for others. In the EPA bioaccumulation guidance (2000), there is a list of three possible approaches for determining bioaccumulation factors (BAFs), given in order of the Agency's preference:

"1. A field-measured BAF, using animals living at or near the top of the food chain.

2. A laboratory-measured BCF, multiplied by an appropriate factor (food chain multiplier, or FCM), reflecting the difference between the laboratory organisms and the field organisms.

3. A BCF modeled from a chemical's octanol-water partitioning coefficient, multiplied by an appropriate FCM."

If a default BAF = 1 of is not acceptable, ERAS recommends that the most preferred EPA options; either field measured BAFs or a laboratory measured BAF should be developed through validation studies. This would either substantiate the claim that soil to mammal BAFs are zero for these chemicals, or result in data that could be used to calculate site specific BAFs. ERAS notes that setting an unknown BAF= 0 essentially eliminates potentially complete exposure pathways from consideration.

3. Table 10-6 (Summary of Terrestrial Bioaccumulation Factors for Chemicals Detected in Soil). A footnote in the table indicates that values were revised based on an error regarding wet weight/dry weight of a sample. This should be discussed in the text, for information purposes. Was this discovered as part of a full data review and if so, was anything else found or changed? ERAS suggests that this review be described in the technical memorandum.

4. (Ecological Exposure Parameters worksheet). Dietary parameters have been changed from the values in SRAM rev 2 (2005) and lack explanation or reference. For example, the deer mouse diet is 50% plants/ 50% invertebrates in the table, with no reference given, while previously the deer mouse diet was 70% plants/30% invertebrates (see SRAM rev 2, 2005, Table 10-4) . Please identify and provide a rationale and references (if available) for any changes made to dietary parameters, for example, if new data has become available regarding the diets, or if they were modified to simplify food web calculations, which appears to be the case for some of the receptors.

Conclusions

ERAS supports/accepts most of the revisions made to the SRAM rev 2, section 12, but has some issues that need to be addressed or clarified. If there are any questions regarding these comments contact Brian Faulkner by phone at (916) 255-6625 or e-mail at bfaulkne@dtsc.ca.gov

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